Missile Defense Agency
Department of Defense

Missile Defense Agency

Flight Test Ground-Based Midcourse Defense -06b (FTG-06b) Report to Congress

11 July 2014

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1.0 Executive Summary

~~(U)~~ This Report to Congress for Flight Test Ground Based Interceptor-06b (FTG-06b) is submitted in accordance with Section 224 of the fiscal year (FY) 2003 Department of Defense Authorization Act, (P.L. 107-314) that requires a report from the Director of the Missile Defense Agency (MDA) to the Congressional defense committees on the results of each flight test of the Ground-based Midcourse national missile defense system, to include a thorough discussion of the content and objectives of the test. This report must provide a statement regarding whether or not the objective was achieved for each test objective. For any test objective not achieved, the report must include a tborough discussion describing the reasons the objective was not achieved.

~~(U)~~ Flight testing is conducted to evaluate, verify, and validate the Ballistic Missile Defense System (BMDS) and the performance of the BMDS Elements. Flight tests are designed to collect and provide accrediting data by addressing the Critical Engagement Conditions (CECs) and Empirical Measurement Events (EMEs) for modeling and simulation tools, used for simulation based acquisition and to demonstrate BMDS hardware and software operational capabilities. Flight tests characterize capabilities against evolving threats and support an incremental acquisition approach to missile defense with an emphasis on improving the effectiveness of defensive capabilities over time, demonstrating interoperability among BMDS elements and components, providing data to assess performance against MDA system engineering objectives, and identifying BMDS issues.

~~(U//FOUO)~~ MDA conducted FTG-06b on June 22, 2014 at 18:49:00.016 universal coordinated time. FTG-06b had one primary objective:

- ~~(U)~~ Demonstrate a long interceptor time-of-flight, medium closing velocity engagement of an Intermediate Range Ballistic Missile (IRBM) class target by a Capability Enhancement II (CE-II) Ground Based Interceptor (GBI), and perform all Exoatmospheric Kill Vehicle (EKV) functions to discriminate and intercept a lethal object from a representative Intercontinental Ballistic Missile (ICBM) target scene with Associated Objects (AOs).

~~(U//FOUO)~~ FTG-06b had two secondary objectives:

- ~~(U)~~ Demonstrate the contributions of BMDS sensors, Command, Control Battle Management, and Communication (C2BMC), and Warfighter Tactics Techniques and Procedures (TTPs) to completion of the GBI engagement.
- ~~(U)~~ Collect data for CE-II capability assessments and model accreditation to the maximum extent possible. Results will be reported out at post-mission test reviews, and used to support model validation.

~~(U//FOUO)~~ The target vehicle, Launch Vehicle 2 (LV-2), was launched from Reagan Test Site (RTS) on Kwajalein Atoll, Repuhlic of the Marshall Islands on a trajectory targeting the Broad Ocean Area (BOA) northeast of the Hawaiian Islands. The target complex was acquired and tracked by the Aegis BMD Radar from its Test Support Position (TSP) near Kwajalein, and the track data was sent to the Link Monitoring Management Tool (LMMT) at the Maritime Operations Center (MOC). Track data was forwarded to the Ground-hased Midcourse Defense Fire Control (GFC) located at Schriever Air Force Base, Colorado by C2BMC via the Air Defense Systems Integrator (ADSI) located at Naval Station Pearl Harbor, Hawaii. A Weapons Task Plan (WTP) was generated by GFC using the Aegis BMD track data and transmitted to the Command Launch Equipment (CLE) at Vandenberg Air Force Base (VAFB). The GBI was launched from an operationally-configured Ground-based Midcourse Defense (GMD) silo, Launch Facility-23 (LF-23), at VAFB. The GBI completed a nominal Orbital Booster Vehicle (OBV) fly-out. GFC generated and sent a search cue to the X-Band Radar (XBR) ahoard the Sea-Based X-Band Radar (SBX) vessel, which acquired the target complex from the cue. The SBX provided track and discrimination reports to GFC that were used to support In-flight Target Updates (IFTUs) provided to the EKV. GFC generated and sent an interceptor search cue to the XBR, which acquired the interceptor from the cue. GFC generated and sent hit assessment tasking to the SBX, which performed hit assessment on the target and sent a hit assessment report to GFC. The SBX continued to collect data on the primary objects in the target complex until Loss of Signal (LOS). A successful intercept was achieved.

~~(U//FOUO)~~ In addition to the system under test elements, the Ground Based Radar - Prototype (GBR-P) at the Reagan Test Site (RTS) collected XBR data during target boost, burnout, and deployment events. The C2BMC Experimentation Lab (X-Lab); Enterprise Sensors Lab (ESL); C2BMC Simultaneous SCOUT; Aegis BMD Test Site; and Aegis Ashore Missile Defense Test Complex (AAMDTC) participated. The Space Tracking and Surveillance System (STSS) did not have a viewing window.

~~(U//FOUO)~~ The quality and quantity of data collected from this test event provided insight into BMDS performance, including BMDS sensor acquisition and tracking capabilities and GFC weapons planning and tasking. Operationally configured fire control, launch command, silo, command and control, remote sensors, and communications assets and interfaces were exercised and FTG-06b demonstrated operationally realistic communications.

2.0 Test Overview

~~(U//FOUO)~~ FTG-06b had one Primary System Test Objective and two Secondary System Test Objectives.

2.1 Primary Test Objective

~~(U//FOUO)~~ The primary objective was to demonstrate a long interceptor time-of-flight, medium closing velocity engagement of an IRBM class target by a CE-II GBI, and perform all EKV functions to discriminate and intercept a lethal object from a representative ICBM target scene with AOs. The primary objective included six GMD evaluation criteria, three supporting CECs and EMEs, and three TTI evaluation criteria. All evaluation criteria supporting the primary objective were met.

2.2 Secondary Test Objective

~~(U//FOUO)~~ Secondary TO #1 was to demonstrate the contributions of BMDS sensors, C2BMC, and Warfighter TTPs to completion of the GBI engagement. There were thirteen evaluation criteria defined to support this secondary objective. All evaluation criteria supporting secondary TO #1 were met.

~~(U//FOUO)~~ Secondary TO #2 was to collect data for CE-II capability assessments and model accreditation to the maximum extent possible. Results will be reported out at post-mission test reviews, and used to support model validation. There were three evaluation criteria defined to support this secondary objective. All evaluation criteria supporting secondary TO #2 were met.

2.3 Critical Engagement Conditions and Empirical Measurement Events

~~(U)~~ Table 2-1 below shows the initial assessment of the primary test objective CECs and EMEs. There were no CECs or EMEs associated with the secondary test objective.

Table 2-1. ~~(U//FOUO)~~ FTG-06b Critical Engagement Conditions and Empirical Measurement Events Outcomes

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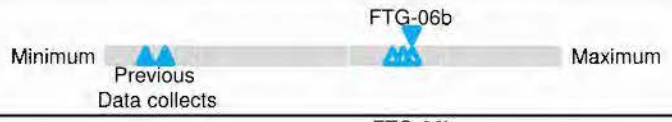
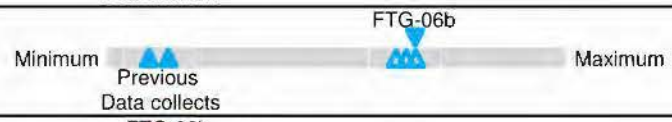
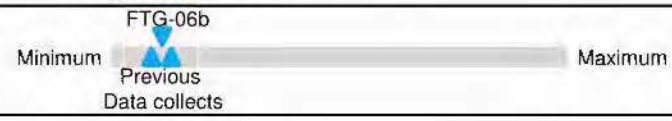
Critical Engagement Conditions and Empirical Measurement Events	FTG-06b Test Outcome	Assessment
Primary		
Long Time of Flight		**Met**
Closing Velocity		**Met**
Exo-atmospheric Kill Vehicle Discrimination		**Met**

▲ - met
△ - not met or limited data collect

2.4 Planned Mission Overview

~~(U)~~ Figure 2-1 below is a graphical depiction of the FTG-06b planned mission with the expected sequence of associated events.

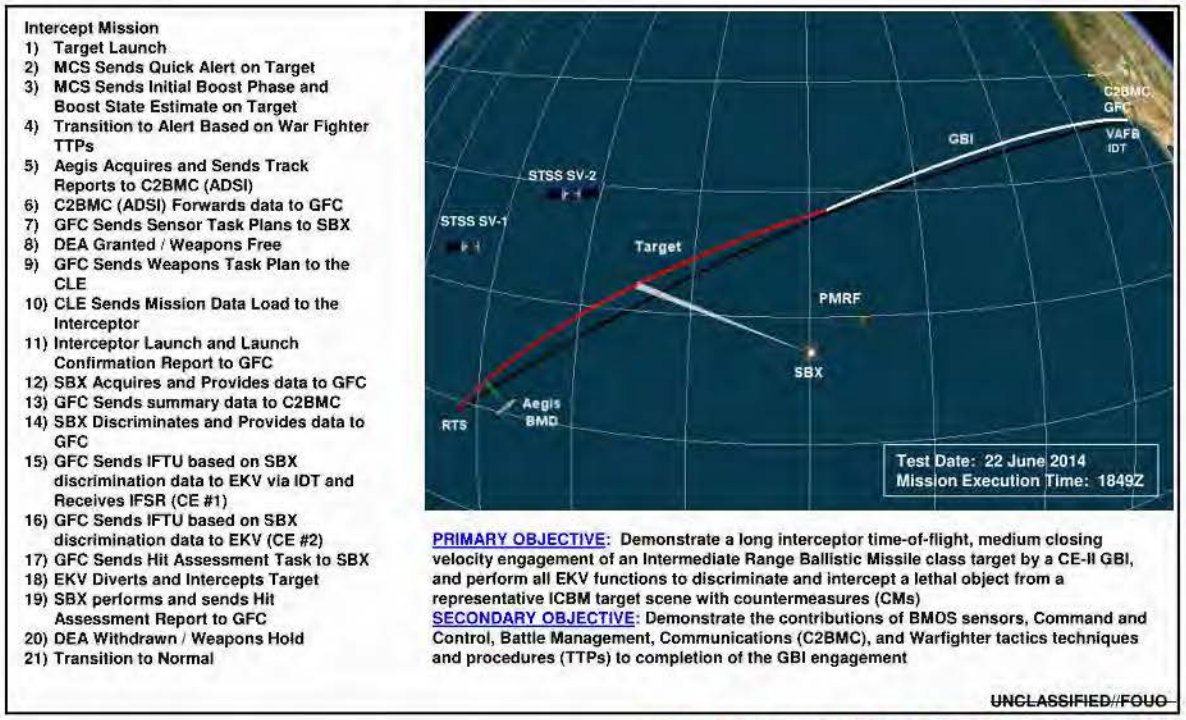


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Figure 2-1. ~~(U)~~ FTG-06b Planned Mission Overview

2.5 Planned Mission Configuration

~~(U)~~ The planned system under test configuration for FTG-06b is shown in Figure 2-2 below.

Figure 2-2. ~~(U)~~ Planned FTG-06b System Under Test Configuration

2.6 Mission Participants

2.6.1 System Under Test Participants

~~(U//FOUO)~~ The planned system under test assists included:

- Space-Based Infrared System
- Aegis BMD Long Range Surveillance & Tracking (LRS&T)
- C2BMC
- SBX
- GMD GBI
- GMD Ground Systems

~~(U//FOUO)~~ In addition to the system under test elements, the following agencies and resources identified in paragraphs 2.6.2 through 2.7 participated in FTG-06b.

2.6.2 Off-Line Test Assets

~~(U//FOUO)~~ The off-line assists included:

- STSS (mission not in viewing window)
- ESL
- X-Lab
- Aegis BMD Test Site
- AAMDTC
- GBR-P
- C2BMC SCOUT

2.6.3 Operational Warfighters

~~(U//FOUO)~~ Operational warfighters participated at the following locations:

- 100th GMD Bde, Missile Defense Integration and Operation Center (MDIOC) Ground-Based Midcourse Defense, Fire Control Missile Defense Element 1, Schriever Air Force Base, in Colorado
- U.S. Northern Command (NORTHCOM) / North American Aerospace Defense Command and Control, Peterson (N2C2) Air Force Base in Colorado
- Space-Based Infrared System (SBIRS) Mission Control Station (MCS) at Buckley Air Force Base, Colorado
- Aegis BMD ship located near Kwajalein Atoll, Repuhlic of the Marshall Islands

2.7 Test Resources

2.7.1 Ranges:

~~(U//FOUO)~~ The test ranges included:

- Vandenberg Air Force Base, Lompoc, California
- Naval Air Warfare Center Weapons Division Point Mugu, California
- Pacific Missile Range Facility, Kauai, Hawaii
- Reagan Ballistic Missile Defense Test Site, Kwajalein Atoll, Repuhlic of the Marshall Islands

2.7.2 Test Assets

~~(U//FOUO)~~ The test assists included:

- Reagan Test Site Kwajalein Atoll, Republic of the Marshall Islands Launch Complex, including radar, optical, and telemetry sensors
- PC Range Safety Systems (PCRSS)
- Transportable Telemetry System 1 (TTS-1) on the Pacific Collector located in the BOA northeast of the Hawaiian Islands
- Transportable Telemetry System 2 (TTS-2)on the Pacific Tracker located in the Broad Ocean Area northeast of the Hawaiian Islands
- X Band Transportable Radar 1 (XTR-1) located on the Pacific Tracker located in the BOA northeast of the Hawaiian Islands
- MDIOC at Schriever Air Force Base, Colorado.
- Downrange Radar, Telemetry and Optical sensors at Vandenberg Air Force Base, California
- Naval Air Warfare Center P-3 Cast Glance
- Missile Defense Communications Operations Node (MIDCON)
- Test Support System (TSS) Telemetry Operations (TM Ops)
- TSS Test and Evaluation Data Acquisition and Communications (TEDAC)
- TSS Translated Global Positioning System (GPS) Range System – Interceptor Only (TGRS)
- High Altitude Observatory – I (HALO-I) northwest of the Hawaiian Islands
- High Altitude Observatory – II (HALO-II) northwest of the Hawaiian Islands
- Pacific Missile Range Facility (PMRF) Telemetry and Radar Assets in Hawaii
- Network, System Integration and Test Environment (NSITE)
- San Nicholas Island (SNI) Telemetry, TGRS, Radar

2.7.3 Shared Assets

~~(U//FOUO)~~ The shared assists included:

- BMDS Lab for Analysis & Data Evaluation Presentation and Integration Centers A, B, and C Missile Defense Integration and Operations Center at Schriever Air Force Base, Colorado
- Mission Command Control A & B, Missile Defense Integration and Operations Center (MDIOC) at Schriever Air Force Base, Colorado
- Presentation and Integration Center B, Redstone Arsenal, Huntsville, Alabama

2.7.4 Operational Assets

~~(U//FOUO)~~ The operational assists included Overhead Sensors (OHS).

~~(U//FOUO)~~ The Operational Test Agency (OTA) participated in FTG-06b from Redstone Arsenal, Huntsville, Alabama. The Development Operational Test & Evaluation (DOT&E) participated from the MDIOC.

3.0 Participating Elements and Components

3.1 Ballistic Missile Defense System Under Test

3.1.1 Ground Based Interceptor

~~(U//FOUO)~~ The FTG-06b mission tested an operationally configured CE-II GBI that was modified to include range safety and telemetry equipment. The GBI is composed of an Orbital Booster Vehicle (OBV) and the EKV. Figure 3-1 below illustrates the components of the GBI. The OBV consists of three solid rocket motor stages, shroud, avionics, antennas, and other equipment required to deliver the EKV to the designated point in space based on ground control commands. The EKV consists of all the flight equipment necessary to complete a hit-to-kill engagement including sensors, signal and data processing computers, and inertial measurement unit, divert and attitude control motors, battery, and a space-to-ground communications system.

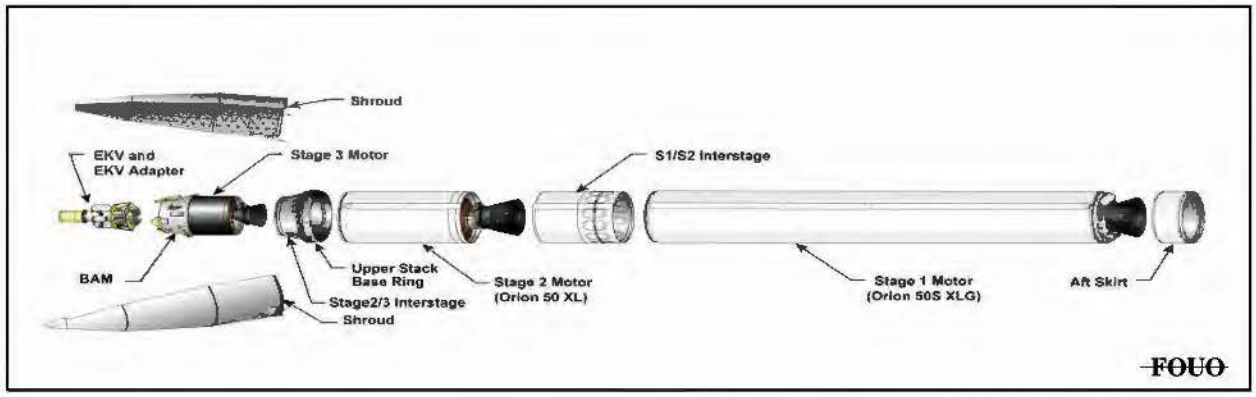

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Figure 3-1. ~~(U)~~ The Capability Enhancement II Ground Based Interceptor

3.1.2 Ground Systems

~~(U//FOUO)~~ The Ground Systems are composed of GFC, GMD communications network, launch site components, CLE, and relocatable in-fight interceptor communication system data terminal. The GFC plans, assesses, directs, coordinates, monitors, and controls all aspects of the GMD element. The GMD communications network provides the infrastructure for the transmission of all GMD element message traffic. The launch site components include the silo and other support equipment required to launch the GBI. The CLE, which provides the interface between the GFC and the GBI, monitors the health and status of interceptor pre-launch events and controls the countdown sequence. The VAFB Relocatable In-Flight Interceptor Communication System (IFICS) data terminal transmits target update information from the GFC to the in-flight EKV and relays status information from the EKV back to the GFC for utilization

in planning for a second communication event. The FTG-06b mission was executed utilizing operational ground systems hardware and software.

3.1.3 Sea-based X-Band Radar

~~(U//FOUO)~~ The SBX, as shown in Figure 3-2 below, is a unique combination of an advanced XBR with a mobile, ocean-going, self-propelled, semi-submersible platform that provides the BMDS a sensor capability that can be positioned to cover any part of the globe. SBX is able to detect, acquire, track, and discriminate targets to provide data necessary to classify and engage ballistic missiles.

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Figure 3-2. ~~(U)~~ Sea-based X-Band Radar

3.1.4 Aegis BMD

~~(U//FOUO)~~ Aegis BMD, shown in Figure 3-3 below, is the naval element of the BMDS. Aegis BMD uses and builds on capabilities inherent in the Aegis Weapon System (AWS), Aegis Radar System (SPY-I) and the Standard Missile (SM), currently deployed on both Aegis cruisers and destroyers.

~~(U//FOUO)~~ Aegis BMD equipped ships detect and track with the SPY-I and provide sensor cueing and track data to other elements of the BMDS using the Aegis weapon system. This capability, which is referred to as LRS&T capability, can support cueing of other BMDS element sensors and support engagement of ballistic missiles by other elements of the BMDS such as GMD.

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Figure 3-3. ~~(U)~~ Aegis BMD

~~(U//FOUO)~~ For this event, the ship at sea conducted LRS&T using a BMD 3.6.1.2 ship to provide tracking data to be used by BMD fire control to generate a weapon task plan to the GBI and to cue SBX.

3.1.5 Command and Control, Battle Management, and Communications

~~(U//FOUO)~~ The C2BMC element as illustrated in Figure 3-4 below is composed of hardware, software, and communications equipment that is configurable to support functionality at multiple fixed locations. Components include workstations, servers, displays, support, and communications equipment necessary to interconnect the C2BMC components and BMDS tactical elements. For FTG-06b, C2BMC version 6.4-2 provided situational awareness to the Warfighter and Combatant Commanders (COCOMS) at Northern Command (NORTHCOM), Pacific Command (PACOM), and Strategic Command (STRATCOM).

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Figure 3-4. ~~(U)~~ C2BMC Element

3.1.6 Space-Based Infrared System

~~(U//FOUO)~~ The Space-Based Infrared System (SBIRS) consists of space-borne surveillance sensors and ground stations. SBIRS was connected to the BMDS communications network for this test.

3.2 Ballistic Missile Defense System Under Test Offline Assets

3.2.1 Space Tracking and Surveillance System – Demonstrators

~~(U//FOUO)~~ The STSS – Demonstrators, as shown in Figure 3-5 below, consist of two low-earth orbiting satellites designed to detect and track ballistic missiles in all stages of flight using infrared sensors. Data from STSS demonstrates how using a low-earth orbiting satellite system can assist United States interceptors in engaging enemy missiles as early as possible in their trajectories and discriminating between warheads and decoys. Each satellite consists of three main components: a wide-view acquisition sensor; a narrow-view tracking sensor; and a signal and data processor subsystem.

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Figure 3-5. ~~(U)~~ Space Tracking and Surveillance System – Demonstrators

3.2.2 Enterprise Sensors Laboratory

~~(U//FOUO)~~ ESL provides research, development and test architecture for integrating a wide variety of enterprise sensors (b)(5) (b)(5) The ESL distributed team (Figure 3-6) process starts with research and development activities, progresses to laboratory demonstrations, then to rigorous BMDS system level flight and ground testing, leading to enhanced capability insertion into the BMDS.

~~(U//FOUO)~~ ESL operates to leverage flight test and real-world events to:

- Improve infrared 3-dimensional tracking to provide fire control quality tracks to interceptors
- Improve burnout prediction to reduce latency and improve cueing to sensors
- Mature sensor fusion algorithms
- Develop prototype software to incorporate new sensors as they come on line
- Investigate alternative approaches to rapidly field promising technologies
- Transition advanced technologies from the lab to the MDA C2BMC / BMDS

Figure 3-6. ~~(U)~~ Enterprise Sensors Lab Distributed Team

3.2.3 C2BMC Experimentation Lab

~~(U//FOUO)~~ The C2BMC Experimentation Lab (X-Lab), as shown in Figure 3-7 below, is the MDA battle command capability for conducting proof of concept demonstrations, prototyping, and operationalizing new C2BMC capabilities. This is accomplished via: future spiral prototyping; assessing prospective BMDS functionalities in a flexible, measurable environment; and performing early integration activities between C2BMC and other BMDS elements.

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Figure 3-7. ~~(U)~~ C2BMC Experimentation Lab

3.2.4 C2BMC Simultaneous Correlation Of Unambiguous Tracks (SCOUT)

(b)(5)

3.2.5 Aegis Ashore Missile Defense Test Complex

~~(U//FOUO)~~ AAMDTC, as shown in Figure 3-8, is the land-based component of the Aegis BMD System located at the Pacific Missile Range Facility in Kauai, Hawaii. Aegis Ashore adapts the present and future Aegis BMD capabilities to address the evolving ballistic missile security environment. The land-based system is designed to be removable to support worldwide deployment. In addition to Aegis BMD at sea, the AAMDTC will be a test and evaluation center in the development of the second phase of the PAA. The test complex will leverage the Aegis BMD Weapon System and the new SM-3 Block IB missile for PAA Phase II deployment, as well as, support deployment decisions and upgrades of future PAA Phase capabilities.

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Figure 3-8. ~~(U)~~ Aegis Ashore Missile Defense Test Complex

3.2.6 Ground-Based Radar – Prototype

~~(U)~~ The GBR-P system, shown in Figure 3-9 below, is an X-band phased array radar capable of simultaneous mechanical and electronic scans. The GBR-P Radar facility is located on the west end of Kwajalein Island.

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Figure 3-9. ~~(U)~~ Ground-Based Radar – Prototype

3.3 Test Support Assets

3.3.1 Target

~~(U//FOUO)~~ The target used for this mission was an instrumented Launch Vehicle (LV)-2 with (b)(3):10 USC §130 (b)(3):10 USC §130 (b)(3):10 USC §130 The target vehicle was integrated and tested at the Lockheed-Martin facility in Courtland, Alabama. Final integration, testing, and launch operations were conducted at RTS.

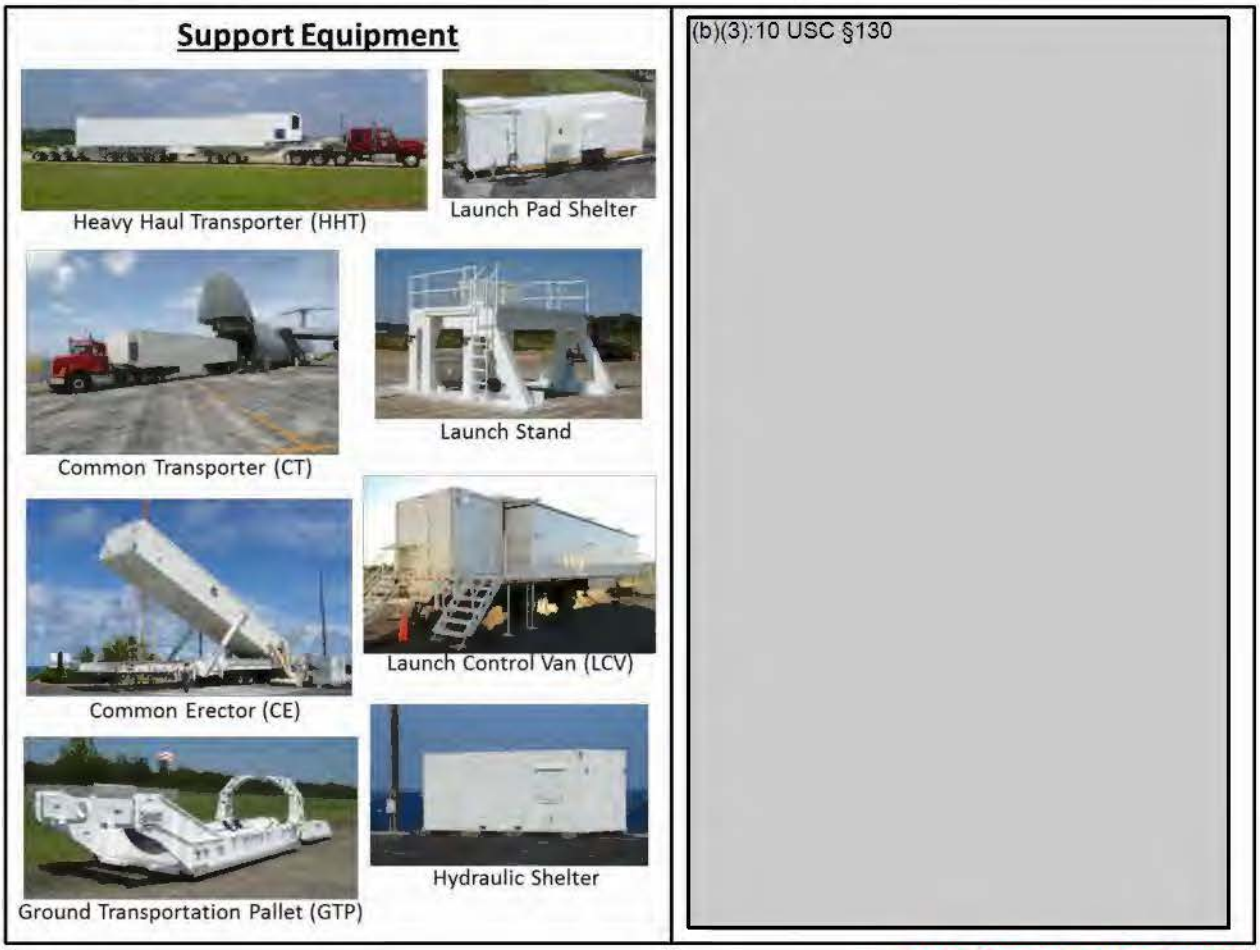

Figure 3-10. ~~(U)~~ FTG-06b Target

3.3.2 Test Resources

~~(U)~~ The responsibilities of Test Resources are to collect, record, and deliver target and interceptor radar, telemetry, and optical data as well as provide real-time Situational Awareness (SA) displays and post mission data products. Test resources supported FTG-06b with multiple ranges and auxiliary sensors. Ranges included the Reagan Test Site (RTS) at Kwajalein, Republic of the Marshall Islands, Vandenberg Air Force Base (near LOMPOC, CA), Pillar Point Air Force Station (PPAFS – near Half Moon Bay, CA), MDIOC at Schriever Air Force Base (Colorado Springs), PMRF on Kauai, Hawaii, and the Naval Air Warfare Center (NAWC) at Point Mugu (near Oxnard, CA), and its test facility, SNI. Auxiliary sensors included the NAWC Cast Glance aircraft, High Altitude Observatory (HALO)-I, HALO-II, TTS-1 located onboard the PC, TTS-2 located onboard the PT as well as the XTR-1 also located on the PT. The Test Support Systems that supported FTG-06b were TM Ops, TGRS and TEDAC. In addition, the Flight Test Communications Network (FTCN), Missile Defense Communications Operations Node (MILCON), and Network, System Integration and Test (NSITE) supported the mission. The Test Architecture is shown in Figure 3-11 below.

Figure 3-11. ~~(U)~~ FTG-06b Test Resources Instrumentation Architecture

~~(U)~~ RTS radar, telemetry and optical assets tracked the target and supported range safety requirements. Telemetry and radar sensors at the PMRF were utilized for data collection on the target and interceptor through planned intercept time. The Hit Grid link was received by PMRF telemetry assets as well as the Pacific Tracker/TTS-2.

~~(U)~~ Range assets at Vandenberg Air Force Base, Pillar Point, Point Mugu, and San Nicolas Island provided telemetry data collection for the GBI (both OBV and the EKV) and supported range safety requirements. GBI position data (required for range safety) was provided by the Translated GPS Range System receiving sites at VAFB, Pillar Point Air Force Station, and San Nicolas Island.

~~(U)~~ Range radars at VAFB, Point Mugu, San Nicolas Island and optical sensors at VAFB provided truth data to assess the GBI performance and to support range safety requirements.

~~(U)~~ The Pacific Collector/TTS-1, operating in the BOA between California and Hawaii, provided mid-range telemetry collection of the OBV and EKV. The Pacific Tracker TTS-2, operating north-east of Hawaii, provided telemetry collection of the EKV as it approached intercept and gathered Hit Grid data as Target approached the EKV. The PT XTR-1 radar tracked the Target for ascent and then slewed to the GBI as planned and returned to track the Target as it approached intercept.

~~(U)~~ The HALO-I collected optical data on the EKV as it approached the intended intercept and beyond. The HALO-II aircraft tracked the Target and collected optical sensor tracking data on the ACM and RV through ballistic flight for characterization and performance assessment.

~~(U)~~ NSITE collected tactical message sets at PACOM, and NORTHCOM for interoperability analysis.

~~(U)~~ Test Resources successfully collected, recorded, and delivered Target and Interceptor radar, telemetry, and optical data as well as delivering real-time SA displays and all post mission data products. All Test Resources test objectives were met. Figure 3-12 shows the detailed results.

Figure 3-12. ~~(U)~~ FTG-06b Test Resources Data Collection

4.0 Analysis and Assessments

~~(U//FOUO)~~ Analysis results indicate that all FTG-06b primary and secondary test objectives and system under test CECs and EMEs were successfully met.

4.1 Ballistic Missile Defense System Under Test

4.1.1 Space-Based Infrared System

~~(U//FOUO)~~ SBIRS was connected to the BMDS communications network for this test and performed normally.

4.1.2 Aegis Ballistic Missile Defense

~~(U//FOUO)~~ Aegis BMD successfully acquired the target complex and provided track data over the operational multi-tactical data link network. Aegis BMD successfully met all of its performance objectives. Aegis BMD tracking data met all accuracy requirements resulting in the generation of an accurate (b)(5)

4.1.3 Command and Control, Battle Management, and Communications

~~(U//FOUO)~~ C2BMC met all of its performance objectives. C2BMC ADSI received Aegis shipboard radar data via LMMT and forwarded all Aegis BMD track data to the GFC. C2BMC also provided situational awareness to PACOM.

4.1.4 Sea-based X-Band Radar

~~(U//FOUO)~~ SBX performed all planned functions during tbe mission and achieved all of its objectives. SBX received a cued search acquisition message from the GFC based on Aegis shipboard radar data. SBX acquired the target complex and provided track data to GFC. (b)(5)
(b)(5)
(b)(5) The SBX continued tracking and collecting data on the primary objects in the target complex until tasked by GFC to perform Hit Assessment on the RV. SBX successfully acquired the EKV and performed Hit Assessment on the RV resulting in a "kill" report to the GFC.

4.1.5 Ground Based Interceptor

~~(U//FOUO)~~ Analysis indicates that all GBI pre-launch activities were conducted in accordance with the normal countdown timeline. The GBI was powered on, and then a series of health and status checks were conducted. Results were normal, and the GBI was verified as ready for firing. (b)(5) (b)(5) The command launch equipment accepted the weapon task plan and the GBI was launched. The GBI executed a nominal OBV fly-out, including all staging events, shroud and EKV separation. EKV power-up and built-in-test were nominal. The EKV received IFTUs from the IDT, responded with an In-Flight Status Report (IFSR), performed the required divert maneuvers, acquired and discriminated the RV, and successfully intercepted the RV.

4.1.6 Ground Systems

~~(U//FOUO)~~ The ground systems component successfully demonstrated the mission critical operations and supported engagement planning, command and control, and communications system level objectives. The GFC successfully orchestrated engagement planning functions from the manual transition to alert through final engagement support planning. GFC accurately generated system-level tracks using SBX and Aegis shipboard radar data and managed these tracks throughout the engagement. (b)(5) (b)(5)

4.2 Ballistic Missile Defense System Under Test Offline Assets

4.2.1 Space Tracking and Surveillance System

~~(U//FOUO)~~ STSS did not have a viewing window during the FTG-06b mission and was unable to collect test data.

4.2.2 Enterprise Sensors Lab

~~(FOUO)~~ ESL successfully transmitted state vectors to C2BMC X-Lab in the BMDS (b)(5) (b)(5) ESL supported the real-time hit

assessment using the System Post Event Evaluation and Reporting (SPEER) workstation, a small business innovative research (SBIR) product that is being matured for future C2BMC spiral's operational use.

4.2.3 C2BMC Experimentation Lab

~~(FOUO)~~ During FTG-06b, the C2BMC X-Lab utilized an (b)(5) (b)(5) (b)(5) assessment by GMD.

4.2.4 C2BMC SCOUT

~~(FOUO)~~ During FTG-06b, the C2BMC SCOUT met all of its objectives. SCOUT captured radar data at GBR-P for post-mission analysis and playback. SCOUT established a real-time data connection from GBR-P to a Huntsville, AL lab and successfully received > 98% of the messages transmitted.

4.2.5 Aegis Ashore Missile Defense Test Complex

~~(U//FOUO)~~ The AAAMDTC participated in FTG-06b as an offline participant to collect data and (b)(5) (b)(5) (b)(5) Post mission analysis of the AAMDTC data is being performed to ensure all test objectives were met.

4.2.6 Ground-Based Radar—Prototype

~~(U//FOUO)~~ The X-Band Sensor GBR-P successfully supported two associated operations for FTG-06b. (b)(5) (b)(5)

4.3 Test Resources

~~(U//FOUO)~~ Assessment indicates that all test resource objectives for optics, radar, target hit grid, Translated GPS Range System, Network System Integration and Test Environment, and telemetry data collection were met. All test resource assets collected expected data.

4.3.1 Test Ranges

4.3.1.1 Reagan Ballistic Missile Defense Test Site

~~(U//FOUO)~~ RTS served as a launch facility for the LV-2 target. Telemetry, including LV-2 Global Positioning System, optical systems, and Kiernan Re-entry Measurement System (KREMS), were successful in supporting target performance assessment and range safety requirements.

4.3.1.2 Vandenberg Air Force Base, California

~~(U//FOUO)~~ VAFB and the support sites at Pillar Point Air Force Station, Point Mugu, and San Nicholas Island, California successfully collected telemetry, radar and optical data to assess GBI and EKV performance and Translated GPS Range System data to support primary range safety requirements.

4.3.1.3 Pacific Missile Range Facility

~~(U//FOUO)~~ The Pacific Missile Range Facility KAM1 and KAM2 antennas supported data collection of the LV-2 target RV and TDV. Hit grid data was collected on the intercept. Two telemetry antennas at the PMRF (including KAM3) supported telemetry collection of the GBI and EKV performance. PMRF Queen 4 and Queen 15 radars supported the data collection of LV-2 RV and TDV debris data.

4.3.2 Auxiliary Sensors

4.3.2.1 HALO -I Aircraft

~~(U//FOUO)~~ The HALO-I aircraft collected optical data to support GBI flight performance and EKV intercept event assessment. The assessment indicates that the HALO-I met all objectives.

4.3.2.2 (b)(5) -II Aircraft

~~(U//FOUO)~~ The HALO-II aircraft collected optical data to support target complex characterization and performance assessment. Data was collected on all primary target objects, as well as debris. Assessment indicates that the HALO-II met all objectives.

4.3.2.3 Pacific Collector/Transportable Telemetry System-1

~~(U//FOUO)~~ The PC/TTS-1 provided mid-range telemetry collection of the OBV, EKV, and hit grid data from the target as it approached intercept. Assessment indicates that all objectives were met.

4.3.2.4 Pacific Tracker/Transportable Telemetry System-2

~~(U//FOUO)~~ The PT/TTS-2 provided mid-range telemetry collection of the OBV, EKV, and hit grid data from the target as it approached intercept. Assessment indicates that all objectives were met.

5.0 Summary

~~(U//FOUO)~~ The Missile Defense Agency successfully conducted FTG-06b on June 22, 2014. All elements successfully participated in mission day pre-launch events and the pre-launch countdown sequence. Analysis indicates all primary and secondary objectives were met and the System Under Test evaluation criteria were demonstrated.

~~(U//FOUO)~~ FTG-06b successfully demonstrated a GBI intercept of a (b)(5) target launched from Reagan Test Site (RTS) on Kwajalein Atoll targeting the BOA northeast of the (b)(5)

~~(U//FOUO)~~ (b)(3):10 USC §130,(b)(5)
(b)(3):10 USC §130,(b)(5)
(b)(3):10 USC §130,(b)(5) The SBX continued to collect data on the primary objects in the target complex until Loss of Signal (LOS).

~~(U//FOUO)~~ FTG-06b successfully met the primary objective by demonstrating a long interceptor time-of-flight, medium closing velocity engagement of an IRBM class target by a CE-II GBI. The EKV discriminated and intercepted the lethal object from a representative ICBM target scene with AOs.

~~(U//FOUO)~~ As required by the primary objective, the target performed all functions and successfully executed the target mission execution letter requirements. Range radars, sensors and hit grid indicators collected data confirming a successful intercept.

~~(U//FOUO)~~ FTG-06b successfully met the secondary system TOs by demonstrating the contributions of BMDS sensors, C2BMC, and Warfighter TTPs to support completion of a successful GBI engagement. Data was collected for CE-II capability assessments and model accreditation to the maximum extent possible.

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